

Claims

What is Claimed is:

1. A multi-channel signal processing system comprising:
 - 2 a transducer signal interface for receiving a plurality of distinct incoming audio
electrical signals produced in response to vibrations of an associated plurality of vibrating
4 elements;
a plurality of signal processors, wherein each processor of said plurality of signal
6 processors receives a selected one of said plurality of incoming audio electrical signals,
wherein each processor of said plurality of signal processors process a received incoming
8 audio electrical signal to produce an audio output signal, wherein said processing of said
received incoming audio electrical signal is performed by variably changing one or more
10 signal attributes of said received incoming audio electrical signal, wherein said one or
more signal attributes is selected from the group consisting of:
 - 12 • pitch, timbre, or timing; and
an output signal interface for providing said audio output signal for each of said
14 plurality of signal processors.
2. The system according to claim 1, wherein at least one processor of said
2 plurality of signal processors is controlled by an incoming signal processing control
signal.
3. The system according to claim 1, wherein each processor of said plurality
2 of signal processors provide said processing according to a selected one of a plurality of
pre-programmed processing instructions.
4. The system according to claim 3, wherein an incoming signal processing
2 control signal is used to select said one of said plurality of pre-programmed mixing
instructions.

5. The system according to claim 1, wherein said plurality of signal
2 processors define first and second groups of signal processors, wherein each signal
processor of said first group of signal processors process said received incoming audio
4 electrical signal by variably changing at least one signal parameter selected from the
group consisting of:

6 • pitch, timbre, or timing,
wherein said second group of signal processors independently process said received
8 incoming audio electrical signal by variably changing at least one signal parameter
selected from the group consisting of:
10 • pitch, timbre, or timing.

6. The system according to claim 1, wherein each processor of said plurality
2 of signal processors further process said received incoming audio electrical signal by
modulating signal amplitude of said received incoming audio electrical signal.

7. The system according to claim 1, wherein at least one of said plurality of
2 vibrating elements is a tunable, fixed-pitch vibrating element.

8. The system according to claim 1, wherein at least one of said plurality of
2 vibrating elements is a variable-pitch vibrating element.

9. The system according to claim 1, wherein each processor of said plurality
2 of signal processors dynamically modulates the timbre of said received incoming audio
electrical signal.

10. The system according to claim 1, wherein each processor of said plurality
2 of signal processors changes the pitch of said received incoming audio electrical signal.

11. The system according to claim 1, wherein each processor of said plurality
2 of signal processors changes the timing of said received incoming audio electrical signal.

12. The system according to claim 1, said system further comprising:
2 a controllable output mixer for receiving said plurality of audio output signals,
wherein said plurality of audio output signals are controllably mixed by said controllable
4 output mixer according to a selected one of a plurality of pre-programmed mixing
instructions to produce at least one outgoing mixed audio output signal.

13. The system according to claim 12, wherein an incoming output mixer
2 control signal is used to select said one of said plurality of pre-programmed mixing
instructions.

14. The system according to claim 12, wherein said controllable output mixer
2 is controlled in real-time by an incoming output mixer control signal.

15. The system according to claim 12, wherein said at least one outgoing
2 mixed audio output signal comprises a signal of MIDI format.

16. The system according to claim 12, wherein said controllable output mixer
2 receives at least one of said incoming audio electrical signals in addition to said plurality
of audio output signals, wherein said controllable output mixer produces said at least one
4 outgoing mixed audio output signal in response to said at least one of said incoming
audio electrical signals and said plurality of audio output signals.

17. The system according to claim 1, wherein said variably changing one or
2 more signal attributes of said received incoming audio electrical signal is performed
continuously or substantially continuously over a perceptible interval of time.

18. The system according to claim 1, wherein each processor of said plurality
2 of signal processors receives a fixed selection of one of said plurality of incoming audio
electrical signals.

19. The system according to claim 18, wherein said selection is determined by
2 a switch.

20. The system according to claim 19, wherein said switch is controlled by
2 stored pre-programmed instructions.

21. The system according to claim 19, wherein said switch is controlled by an
2 incoming switch control signal.

22. The system according to claim 21, wherein said incoming switch control
2 signal comprises a signal of MIDI format.

23. A method for multi-channel signal processing comprising:
2 receiving a plurality of distinct incoming audio electrical signals produced in
response to vibrations of an associated plurality of vibrating elements;
4 directing each electrical signal of said plurality of distinct audio electrical signals
to a particular signal processor of a plurality of signal processors; and
6 individually processing received incoming audio electrical signals at each
processor of said plurality of signal processors, said processing includes variably
8 changing one or more signal attributes of said received incoming audio electrical signal,
wherein said one or more signal attributes is selected from the group consisting of:
10 • pitch, timbre, or timing,
wherein said processing results in an audio output signal for each processor of said
12 plurality of signal processors.

24. The method according to claim 23, wherein at least one processor of said
2 plurality of signal processors is controlled by an incoming signal processing control
signal.

25. The method according to claim 23, wherein each processor of said
2 plurality of signal processors provide said processing according to a selected one of a
plurality of pre-programmed processing instructions.

26. The method according to claim 25, wherein an incoming signal processing
2 control signal is used to select said one of said plurality of pre-programmed mixing
instructions.

27. The method according to claim 23, wherein said plurality of signal
2 processors define first and second groups of signal processors, wherein each signal
processor of said first group of signal processors process said received incoming audio
4 electrical signal by variably changing at least one signal parameter selected from the
group consisting of:

6 • pitch, timbre, or timing,

wherein said second group of signal processors independently process said received
8 incoming audio electrical signal by variably changing at least one signal parameter
selected from the group consisting of:

10 • pitch, timbre, or timing.

28. The method according to claim 23, wherein each processor of said
2 plurality of signal processors further process said received incoming audio electrical
signal by modulating signal amplitude of said received incoming audio electrical signal.

29. The method according to claim 23, wherein at least one of said plurality of
2 vibrating elements is a tunable, fixed-pitch vibrating element.

30. The method according to claim 23, wherein at least one of said plurality of
2 vibrating elements is a variable-pitch vibrating element.

2 31. The method according to claim 23, wherein each processor of said plurality of signal processors dynamically modulates the timbre of said received incoming audio electrical signal.

2 32. The method according to claim 23, wherein each processor of said plurality of signal processors changes the pitch of said received incoming audio electrical signal.

2 33. The method according to claim 23, wherein each processor of said plurality of signal processors changes the timing of said received incoming audio electrical signal.

2 34. The method according to claim 23, said system further comprising:
2 a controllable output mixer for receiving said plurality of audio output signals,
4 wherein said plurality of audio output signals are controllably mixed by said controllable
4 output mixer according to a selected one of a plurality of pre-programmed mixing
instructions to produce at least one outgoing mixed audio output signal.

2 35. The method according to claim 34, wherein an incoming output mixer control signal is used to select said one of said plurality of pre-programmed mixing instructions.

2 36. The method according to claim 34, wherein said controllable output mixer is controlled in real-time by an incoming output mixer control signal.

2 37. The method according to claim 34, wherein said at least one outgoing mixed audio output signal comprises a signal of MIDI format.

38. The method according to claim 34, wherein said controllable output mixer
2 receives at least one of said incoming audio electrical signals in addition to said plurality
of audio output signals, wherein said controllable output mixer produces said at least one
4 outgoing mixed audio output signal in response to said at least one of said incoming
audio electrical signals and said plurality of audio output signals.

39. The method according to claim 23, wherein said variably changing one or
2 more signal attributes of said received incoming audio electrical signal is performed
continuously or substantially continuously over a perceptible interval of time.

40. The method according to claim 23, wherein each processor of said
2 plurality of signal processors receives a fixed selection of one of said plurality of
incoming audio electrical signals.

41. The method according to claim 23, wherein said selection is determined
2 by a switch.

42. The method according to claim 41, wherein said switch is controlled by
2 stored pre-programmed instructions.

43. The method according to claim 41, wherein said switch is controlled by an
2 incoming switch control signal.

44. The method according to claim 43, wherein said incoming switch control
2 signal comprises a signal of MIDI format.

45. A signal processing system comprising:

2 a transducer signal interface for receiving a plurality of incoming audio electrical
signals produced in response to vibrations of an associated plurality of vibrating
4 elements;

a controllable input mixer for selectively mixing said plurality of incoming audio
6 electrical signals to generate a plurality of mixed output signals, said mixing
accomplished by mixing proportions of two or more of said plurality of incoming audio
8 electrical signals to generate said plurality of mixed output signals, wherein said mixing
proportions is determined by an incoming mixer control signal;

10 a plurality of signal processors, wherein each signal processor of said plurality of
signal processors receives at least one of said plurality of incoming audio electrical
12 signals, wherein each processor of said plurality of signal processors process said
received incoming audio electrical signals by variably changing one or more signal
14 attributes of said received incoming audio electrical signal, wherein said one or more
signal attributes is selected from the group consisting of:

16 • pitch, timbre, or timing,

wherein each processor, of said plurality of signal processors, separately process
18 individual or selected mixes of said received incoming audio electrical signals to produce
an audio output signal; and

20 an output signal interface for providing an audio output signal for each processor
of said plurality of signal processors.

46. The system according to claim 45, wherein said incoming input mixer
2 control signal comprises a signal of MIDI format.

47. The system according to claim 45, wherein said controllable input mixer
2 selectively mixes said plurality of incoming audio electrical signals according to a
selected one of a plurality of pre-programmed mixing instructions.

2 48. The system according to claim 45, wherein said controllable input mixer is controlled in real-time by said incoming input mixer control signal.

2 49. The system according to claim 45, wherein said incoming input mixer control signals is generated by processing at least one of said plurality of incoming audio electrical signals.

2 50. The system according to claim 45, wherein said plurality of audio output signals are provided to an output mixer to generate a plurality of mixed audio output signals.

2 51. The system according to claim 50, wherein said output mixer is a controllable mixer, said output mixer mixing proportions of two or more of said plurality of audio output signals to generate said plurality of mixed audio output signals, wherein
4 said mixing proportions of said output mixer is determined by an output mixer control signal.

2 52. The system according to claim 46, wherein said controllable output mixer selectively mixes said plurality of incoming audio electrical signals according to a selected one of a plurality of pre-programmed mixing instructions.

2 53. The system according to claim 46, wherein said output mixer control signal comprises a signal of MIDI format.

2 54. The system according to claim 45, wherein said controllable output mixer is controlled in real-time by said output mixer control signal.

2 55. The system according to claim 54, wherein said output mixer control signals are generated by processing at least one of said plurality of incoming audio electrical signals.

2 56. The system according to claim 45, wherein each processor of said plurality of signal processors processes said received incoming audio electrical signals according to a selected one of a plurality of pre-programmed processing instruction.

2 57. The system according to claim 56, wherein an incoming signal processing control signal is used to select said one of said plurality of pre-programmed processing instruction.

2 58. The system according to claim 45, wherein at least one processor of said plurality of signal processors is controlled by an incoming signal processing control signal.

2 59. The system according to claim 58, wherein said signal processing control signals are generated by processing at least one of said plurality of incoming audio electrical signals.

2 60. The system according to claim 58, wherein said incoming signal processing control signal comprises a signal of MIDI format.

2 61. The system according to claim 45, wherein said variably changing one or more signal attributes of said received incoming audio electrical signal is performed continuously or substantially continuously over a perceptible interval of time.

62. A signal processing method comprising:
2 receiving a plurality of incoming audio electrical signals produced in response to
vibrations of an associated plurality of vibrating elements;
4 selectively mixing said plurality of incoming audio electrical signals using a
controllable input mixer to generate a plurality of mixed output signals, said mixing
6 accomplished by mixing proportions of two or more of said plurality of incoming audio
electrical signals to generate said plurality of mixed output signals, wherein said mixing
8 proportions is determined by an incoming mixer control signal;
directing each electrical signal of said plurality of distinct audio electrical signals
10 to a particular signal processor of a plurality of signal processors; and
individually processing received incoming audio electrical signals at each
12 processor of said plurality of signal processors, said processing includes variably
changing one or more signal attributes of said received incoming audio electrical signal,
14 wherein said one or more signal attributes is selected from the group consisting of:
• pitch, timbre, or timing,
16 wherein said processing results in an audio output signal for each processor of said
plurality of signal processors.

63. The method according to claim 62, wherein said incoming input mixer
2 control signal comprises a signal of MIDI format.

64. The method according to claim 62, wherein said controllable input mixer
2 selectively mixes said plurality of incoming audio electrical signals according to a
selected one of a plurality of pre-programmed mixing instructions.

65. The method according to claim 62, wherein said controllable input mixer
2 is controlled in real-time by said incoming input mixer control signal.

2 66. The method according to claim 62, wherein said incoming input mixer control signals is generated by processing at least one of said plurality of incoming audio electrical signals.

2 67. The method according to claim 62, wherein said plurality of audio output signals are provided to an output mixer to generate a plurality of mixed audio output signals.

2 68. The method according to claim 67, wherein said output mixer is a controllable mixer, said output mixer mixing proportions of two or more of said plurality of audio output signals to generate said plurality of mixed audio output signals, wherein
4 said mixing proportions of said output mixer is determined by an output mixer control signal.

2 69. The method according to claim 68, wherein said controllable output mixer selectively mixes said plurality of incoming audio electrical signals according to a selected one of a plurality of pre-programmed mixing instructions.

2 70. The method according to claim 68, wherein said output mixer control signal comprises a signal of MIDI format.

2 71. The method according to claim 62, wherein said controllable output mixer is controlled in real-time by said output mixer control signal.

2 72. The method according to claim 71, wherein said output mixer control signals are generated by processing at least one of said plurality of incoming audio electrical signals.

73. The method according to claim 62, wherein each processor of said
2 plurality of signal processors processes said received incoming audio electrical signals
according to a selected one of a plurality of pre-programmed processing instruction.

74. The method according to claim 73, wherein an incoming signal processing
2 control signal is used to select said one of said plurality of pre-programmed processing
instruction.

75. The method according to claim 62, wherein at least one processor of said
2 plurality of signal processors is controlled by an incoming signal processing control
signal.

76. The method according to claim 75, wherein said signal processing control
2 signals are generated by processing at least one of said plurality of incoming audio
electrical signals.

77. The method according to claim 75, wherein said incoming signal
2 processing control signal comprises a signal of MIDI format.

78. The method according to claim 62, wherein said variably changing one or
2 more signal attributes of said received incoming audio electrical signal is performed
continuously or substantially continuously over a perceptible interval of time.

79. A multi-channel signal processing system comprising:
2 a transducer signal interface for receiving a plurality of distinct incoming audio
electrical signals produced in response to vibrations of an associated plurality of vibrating
4 elements;
a plurality of signal processors, wherein each signal processor of said plurality of
6 signal processors receives one of said plurality of incoming audio electrical signals,
wherein each processor of said plurality of signal processors perform pitch shifts on a
8 received incoming audio electrical signal to produce an audio output signal; and
an output signal interface for providing said audio output signal for each of said
10 plurality of signal processors.

80. The system according to claim 79, wherein at least one processor of said
2 plurality of signal processors is controlled by an incoming signal processing control
signal.

81. The system according to claim 79, wherein each processor of said plurality
2 of signal processors provide said processing according to a selected one of a plurality of
pre-programmed processing instructions.

82. The system according to claim 81, wherein an incoming signal processing
2 control signal is used to select said one of said plurality of pre-programmed mixing
instructions.

83. The system according to claim 79, wherein each processor of said plurality
2 of signal processors further process said received incoming audio electrical signal by
modulating signal amplitude of said received incoming audio electrical signal.

84. The system according to claim 79, wherein at least one of said plurality of
2 vibrating elements is a tunable, fixed-pitch vibrating element.

85. The system according to claim 79, wherein at least one of said plurality of
2 vibrating elements is a variable-pitch vibrating element.

86. The system according to claim 79, said system further comprising:
2 a controllable output mixer for receiving said plurality of audio output signals,
wherein said plurality of audio output signals are controllably mixed by said controllable
4 output mixer according to a selected one of a plurality of pre-programmed mixing
instructions to produce at least one outgoing mixed audio output signal.

87. The system according to claim 86, wherein an incoming output mixer
2 control signal is used to select said one of said plurality of pre-programmed mixing
instructions.

88. The system according to claim 86, wherein said controllable output mixer
2 is controlled in real-time by an incoming output mixer control signal.

89. The system according to claim 86, wherein said at least one outgoing
2 mixed audio output signal comprises a signal of MIDI format.

90. The system according to claim 86, wherein said controllable output mixer
2 receives at least one of said incoming audio electrical signals in addition to said plurality
of audio output signals, wherein said controllable output mixer produces said at least one
4 outgoing mixed audio output signal in response to said at least one of said incoming
audio electrical signals and said plurality of audio output signals.

91. A method for multi-channel signal processing comprising:
2 receiving a plurality of distinct audio electrical signals produced in response to
vibrations of an associated plurality of vibrating elements;
4 directing each electrical signal of said plurality of distinct audio electrical signals
to a particular signal processor of a plurality of signal processors; and
6 individually processing received incoming audio electrical signals at each
processor of said plurality of signal processors, said processing includes performing pitch
8 shifts on said received incoming audio electrical signal to produce an audio output signal
for each processor of said plurality of signal processors.

92. The method according to claim 91, wherein at least one processor of said
2 plurality of signal processors is controlled by an incoming signal processing control
signal.

93. The method according to claim 91, wherein each processor of said
2 plurality of signal processors provide said processing according to a selected one of a
plurality of pre-programmed processing instructions.

94. The method according to claim 93, wherein an incoming signal processing
2 control signal is used to select said one of said plurality of pre-programmed mixing
instructions.

95. The method according to claim 91, wherein each processor of said
2 plurality of signal processors further process said received incoming audio electrical
signal by modulating signal amplitude of said received incoming audio electrical signal.

96. The method according to claim 91, wherein at least one of said plurality of
2 vibrating elements is a tunable, fixed-pitch vibrating element.

97. The method according to claim 91, wherein at least one of said plurality of
2 vibrating elements is a variable-pitch vibrating element.

98. The method according to claim 91, wherein a controllable output mixer
2 is used for receiving said plurality of audio output signals, wherein said plurality of audio
output signals are controllably mixed by said controllable output mixer according to a
4 selected one of a plurality of pre-programmed mixing instructions to produce at least one
outgoing mixed audio output signal.

99. The method according to claim 98, wherein an incoming output mixer
2 control signal is used to select said one of said plurality of pre-programmed mixing
instructions.

100. The method according to claim 98, wherein said controllable output mixer
2 is controlled in real-time by an incoming output mixer control signal.

101. The method according to claim 98, wherein said at least one outgoing
2 mixed audio output signal comprises a signal of MIDI format.

102. The method according to claim 98, wherein said controllable output mixer
2 receives at least one of said incoming audio electrical signals in addition to said plurality
of audio output signals, wherein said controllable output mixer produces said at least one
4 outgoing mixed audio output signal in response to said at least one of said incoming
audio electrical signals and said plurality of audio output signals.